hypothesis ought to convey to him the idea of blue, the error, although not appearing worse to the normal-eyed than calling grass red, would be altogether inconsistent with the proper colour-blind sensations, and would prove that such a person had not dichromic vision in the sense here intended.[1]

It may further be remarked that, as the colour-blind person finds the yellow sensation much predominating in what he sees, and as he will have observed that it corresponds to a larger number of ordinary colour-words than the blue sensation, his vocabulary for this group will be naturally more copious than for the opposite one.

WILLIAM POLE

(*To be continued.*)

CHEMICAL NOTES

ESTIMATION OF MERCURY.—Prof. Clark, of Cincinnati, describes (*Ber. d. deutsch. chem. Gesell.* xi. 1,409) an interesting application of electrolytic decomposition for the purposes of analytical chemistry, viz., in the separation and estimation of mercury. The solution of the mercury salt, acidulated with sulphuric acid, is placed in a platinum vessel, connected with the zinc pole of a Bunsen bichromate battery of six cells. A piece of platinum foil in connection with the carbon pole is dipped into the liquid, and the decomposition commences at once. At first a mercurous salt is precipitated. This is reduced gradually, until, in the course of an hour, it is completely changed into the metal, which requires simply to be separated from the solution, washed, dried, and weighed. Similar methods for the estimation of zinc, nickel, and copper have for some years been in use.

SEPARATION OF ANTIMONY AND ARSENIC.—One of the problems in analytical chemistry awaiting solution is a satisfactory separation of arsenic from antimony. In the last number of Liebig's *Annalen* (vol. 192) Prof. Bunsen presents a new method intended to supersede that hitherto employed, which was discovered by him a number of years since, depending on the treatment of the combined sulphides with sulphurous acid. In the new process the sulphides are dissolved in potash and subjected to the action of chlorine. A quantity of a saturated aqueous solution of sulphuretted hydrogen, sufficient to precipitate the antimony, as Sb_2S_5, is then added, and in the filtrate the arsenic acid is precipitated on heating as As_2S_5 by a long-continued stream of H_2S.

SPECIFIC HEATS OF MERCURY AND IRON.—O. Pettersson and E. Hedelius have recently made careful determinations of the specific heat of mercury and iron in the following manner (*Ofvers. f. Vetensk. Förhandl.*, 37, p. 35):—A piece of wrought iron was heated in an air bath to 26°, and then plunged in baths containing weighed quantities of mercury and water at 0°. The resultant temperatures gave the specific heat of iron as referred, firstly to water, and secondly to mercury, and the division of the first value by the second yielded the specific heat of mercury referred to water. The averages derived from twenty experiments give for the average specific heat of wrought iron between 4° and 27°, 0·10808; and for the specific heat of mercury between 0° and 5°, 0·033266. The authors find that the specific heat of mercury suffers but slight alterations between 0° and 100°.

LATENT HEAT OF WATER AT TEMPERATURES BELOW 0° C.—O. Pettersson (*Ofvers. f. Vetensk. Förhandl.*, 37, p. 53) has lately determined the latent heat of water at temperatures below 0°. For this purpose thin tubes containing water were placed in a mercury calorimeter, cooled to certain temperatures below 0°, and congelation was induced by the insertion of a snow crystal. The latent heat of water at 0° according to Regnault is 79·25. The results obtained by Pettersson at lower temperatures are as follows: − 2·80°, 77·71; − 4·995°, 76·60; − 6·28°, 75·94; − 6·50°, 76·03; − 6·62°, 75·99; all of them coinciding closely with the estimations of the theoretical formula $\frac{\delta r}{\delta T} = c - h$, where r represents the latent heat of fusion, T the absolute temperature, and $c - h$ the difference between the specific heats of the solid and liquid body. Experiments were likewise made with sea water containing 3·536 per cent. of solid matter, and freezing at − 9°. At this temperature pure water would possess a latent heat of 75; the sea water possessed on the contrary but 54, showing that the above proportion of saline matter was sufficient to cause a diminution of 28 per cent. in the latent heat.

PREPARATION OF SALTS OF NITROUS OXIDE.—In the *Journal* of the Chemical Society (clxxxix.) Mr. A. E. Menké describes some of the above salts. In analysing a sample of cast iron an experiment was made attempting the conversion of the phosphorus contained in it by fusion with nitre and sodium carbonate, into an alkaline phosphate. During the operation a bulky yellow precipitate was obtained which proved to be, not a phosphate, but identical with the body obtained by Dr. Divers in the action of sodium amalgam on sodium nitrate. The analysis of the silver salt gave a mean percentage of 78·09 Ag, agreeing therefore with the formula AgNO, which requires 78·26 per cent. Ag. The salt may also be obtained by the simple fusion of iron filings with nitre, the best heat to employ being that of a charcoal furnace. The analysis of the sodium salt obtained by the fusion of iron filings with sodium nitrate gave numbers closely agreeing with the formula $NaNO + 3H_2O$. The substitution of zinc for iron filings failed to produce the body. On acting on the silver salt with ethyl iodide the silver is converted into iodide, and on fractionating the distillate evidence of the formation of an ethereal salt of low boiling point is obtained.

ON MANGANESE TETRACHLORIDE ($MnCl_4$).—Some doubt still existing with regard to the decomposition of manganese oxides higher than the dioxide MnO_2, Mr. W. Fisher has recently made experiments bearing upon this point. The oxides employed are the sesquioxide, Mn_2O_3, and the red oxide of manganese, Mn_3O_4. The analyses of the liquids obtained by the action of the acid on the different oxides were made by decomposing the freshly-prepared solutions with potassium iodide, and then titrating the amount of iodine liberated in each case with sodium hyposulphite. From his experiments Mr. Fisher finds that the higher oxides when treated with excess of acid give a brown liquid containing a highly chlorinated manganese compound easily resolved into manganous chloride and free chlorine, and on dilution with water yielding manganese binoxide in both instances. The solutions appear to be identical, probably containing $MnCl_4$ in each. Under the conditions of the experiment the corresponding chlorides, Mn_2Cl_6 and Mn_2Cl_8, do not appear to be formed from their corresponding oxides, nor do they appear as products of the partial dechlorination of the tetrachloride. The action of the acid on the two oxides the author considers may be represented by the formulæ—

$$Mn_2O_3 + 6HCl = MnCl_2 + MnCl_4 + 3H_2O,$$
$$Mn_3O_4 + 8HCl = 2MnCl_2 + MnCl_4 + 4H_2O,$$

and as a large excess of acid or alkaline chloride renders $MnCl_4$ more stable, he thinks it probable that this body may exist in a form analogous to chloroplatinic acid.

SPONTANEOUS IGNITION OF HYDROGEN BY FINELY-DIVIDED ZINC.—In dissolving zinc in hydrochloric acid P. W. Hofmann has observed explosions on the surface

[1] Some errors might, however, legitimately arise in the use of the words for red and green, from the fact that some hues of these colours give yellow sensations, while others give blue sensations.

of the liquid in the vessels employed. These phenomena he describes in a paper in the *Chem. Centr.*, 1878, 351, and explains them by the supposition that the gas in its evolution throws up small portions of zinc, rendered porous by the action of the acid, and that these finely-divided particles coming in contact with the air act like spongy platinum, causing the gaseous mixture to explode. The spontaneous ignition of hydrogen has been observed by others, but no satisfactory explanation has been given of the action.

METEOROLOGICAL NOTES

CAPT. HOFFMEYER has made an original and highly important contribution to our knowledge of the distribution of atmospheric pressure in winter over the North Atlantic, and its influence on the climate of Europe, in the last published number of the *Journal of the Meteorological Society of Austria* (October 15). The contribution takes the form of a rectification of Buchan's isobaric charts for this part of the globe, and, by a most ingenious and able method of investigation, entirely his own, Hoffmeyer conclusively shows that Greenland and Iceland exert a powerful influence on the distribution of atmospheric pressure not hitherto properly recognised, resulting in the mean minimum of pressure being localised distinctly to the south-west of Iceland—a minimum accompanied with two subordinate minima, one in Davis Straits and the other in the Arctic Ocean, mid-way between Jan Mayen and the Lofoden Isles. Four typical charts are also given, showing the actual mean pressure of as many individual winter months, from which it is plain that one or other of these three minima plays the chief roll, the other two being, for the time, subordinate; and that, according as the one or the other of these minima of pressure predominates, so is the character of the weather, as regards its mildness or severity, of the winter of the regions surrounding the North Atlantic, determined.

THE *Report of the Royal Meteorological Institute of Prussia for* 1877 has been received. It is the thirtieth Report, and like all the foregoing Reports, is published by the Royal Statistical Bureau, Berlin, with which the Institute, since its establishment in 1848, has stood in close and uninterrupted connection. Important changes are in contemplation, the most vital of which are the severance of the connection between the Institute and the Statistical Bureau, and the establishment of an independent central direction for meteorology. The Bureau has done a graceful act in presenting with the Report a highly characteristic portrait of the veteran meteorologist and physicist Dove, who has directed the affairs of the Institute since December 9, 1848, and who, by the number and thoroughness of his writings and their breadth of view, deserves of all men to be styled the father of meteorology.

AMONG the separate papers incorporated in this Report is a discussion by Dr. Hellmann of the observations of cloud at Crefeld, being in continuation of the author's researches into the cloud-covering of the sky as influenced by the hour of the day, the season of the year, and geographical situation. The daily maximum occurs at Crefeld, about, or a little before sunrise, from September to April, whereas, from May to August, the maximum is from about 11 A.M. to 3 P.M. The monthly maximum, which holds also for all hours of the day, is December, whilst the month with clearest skies is September. The barometric observations at Berlin for the past thirty years are carefully discussed by Prof. Arndt, from the general results of which it appears that the great summer depression of the barometer which is so characteristic a feature of the climatology of the Europeo-Asiatic Continent, is not shown at Berlin, it being a little to eastwards of Berlin, to which the limits of the western outskirts of this widespread barometric depression extend.

THE Dutch Meteorological Institute has issued Wind Charts of the North Atlantic, Series I., including the six months from December to May. The region covered by the charts lies between 51—30° N. lat. and 4—52° W.long., and between 30—8° N. lat., and 13—39° W. long. The frequency of the different winds is graphically shown by radii, the length of each being proportional to the frequency of the particular wind it represents. Instead of grouping the observations into 5° squares and into seasons as has been generally done, Dr. Buys Ballot has presented the facts on the charts for each 1° square and for each month, the object being to lay down the geographical position of the winds of this region, so important to navigators as well as men of science, with the closest approach to truth and least possible admixture of hypothesis.

IN a circular letter addressed to the Permanent Committee on Meteorology, Prof. Hildberandsson invites the co-operation of all meteorologists to the carrying out of a more systematic observation of the upper currents of the atmosphere than has yet been attempted. Hitherto the observation of the upper clouds and the directions in which they march, has been confined to isolated observers whose services were enlisted through the enthusiasm of individual meteorologists. But fragmentary and scattered though the observations have necessarily been, the results fairly deduced from them are of so important a nature from their bearings on the great problem of atmospheric circulation, that we have no hesitation in giving our hearty support to Prof. Hildebrandsson's proposal that the meteorological societies and observatories make observations of the movements of clouds, chiefly of the upper clouds, part and parcel of their regular observations, and that the results regularly appear in their publications.

THE great storm of September 15-16, so widely and so severely felt, deserves to be specially noticed on account of the low barometers accompanying it, which were not only exceptionally low for the season but even exceptionally low for any season of the year. From the observations made at the stations of the Scottish Meteorological Society in the north and north-west it is seen that at Thorshavn, Farö, the barometer at 32° and sea-level fell at 9 P.M. of the 15th to 28·058 inches, being the lowest point to which it fell, and about that time the wind shifted from south-east to north-west. At Stornway the barometer fell to its lowest, 28·400 inches at 7 P.M., or two hours earlier than in Farö; at the same hour it fell to the lowest point, 28·457 inches, at Monach lighthouse, the wind at this time attaining its maximum violence during the storm; at Sandwick to 28·404 at midnight; and at North Unst lighthouse it fell during the night to 28·305 inches. Heavy showers with thunder and lightning and heavy continued rain occurred in the North-west Highlands, nearly an inch of rain falling in less than an hour at Portree on the morning of the 15th, and 10·57 inches at Glenquoich during the six days beginning with the 14th.

GEOGRAPHICAL NOTES

THE Gothenburg *Handels Tidning*, of the 16th inst., contains a telegram from Irkutsk, addressed to Mr. Oscar Dickson by Prof. Nordenskjöld, announcing that he had reached the mouth of the Lena on August 27, after having passed Cape Chelyuskin, without meeting with any noteworthy obstacle from ice, and that the voyage would be continued towards Behring's Straits with the highest hopes of success. It is probable that Prof. Nordenskjöld's anticipations have been by this time realised, that the *Vega* has reached Behring's Straits, and thus successfully accomplished the North-East Passage. News has also arrived that the *Lena*, a small steamer which accompanied the *Vega*, has ascended the